I. Project Title:
Native fish response to nonnative fish control in the middle Green River, Utah.

II. Principal Investigator:

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III. Project Summary:

Control actions targeting nonnative gamefish species are being evaluated across the Upper Basin to determine the level of reduction in abundance of these species necessary to minimize the threat to the recovery of the endangered Colorado River fishes. There are two key aspects to evaluating control of nonnative fishes: (1) can the abundance of the target species be reduced significantly by the approaches employed, and (2) is there a measurable positive response by populations of the endangered fish species and associated native fish community?

Given the preliminary stage of nonnative fish control evaluations and the confinement to select river reaches, the most likely first observed positive response will be evident in early life-stages of the native fish community (e.g. flannelmouth and bluehead sucker, roundtail chub and speckled dace). Adult response will not be observed for several years following any significant removal. Also, a response may not be observed because of the large ranging area of adults. A positive response in endangered fish species may be more difficult to measure statistically without a longer time frame for observation due to generation times within endangered fish populations. Data necessary for these analyses will be generated by current and future young-of-year sampling and population estimation projects for these endangered species in conjunction with nonnative fish removal efforts.

This project will focus on determining a response of early life-stages of native and small-bodied fishes to removal of nonnative predators, primarily smallmouth bass and northern pike. These fish will serve as indicators of the response that would be experienced by endangered fish species occupying the same habitat types, if their numbers were high enough to detect such a response. This project is slated to continue through FY2008.

IV. Study Schedule: 2005 – 2008

V. Relationship to RIPRAP:

Green River Action Plan: Mainstem

III. Reduce negative impacts of nonnative fishes and sportfish management activities (Nonnative and sportfish management)
III.A.2.c Evaluate the effectiveness (e.g., nonnative and native fish response) and develop and implement an integrated, viable active control program.

VI. Accomplishment of FY 2006 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Objective 1: Implement removal of northern pike from Island Park to Sand Wash and smallmouth bass from Split Mountain to Sand Wash.

Removal of northern pike in the middle Green River began in the spring of 2001 in the middle Green River in the reach of river from Island Park to Sand Wash (Project # 109). Smallmouth bass removal was initiated in early June 2004 beginning at Split Mountain to Sand Wash (Project # 123).

Objective 2: Assess abundance of northern pike and smallmouth bass in the middle Green River to determine removal effect.

All northern pike captured from Island Park to Sand Wash are being removed during northern pike removal efforts (which began in 2001). Since the initiation of the project, catch rates have declined substantially. In 2001, 248 northern pike were removed from the middle Green River and with approximately the same effort; in 2003 only 22 were captured and removed. This numbers appears to be steady as 20 fish were captured and removed in 2006. Catch-per-effort has been used each year to estimate annual abundance of northern pike in the middle Green River. Capture-recapture abundance estimates were planned for smallmouth bass each year by completing one tagging pass and three removal passes from Split Mountain (RM 318) to Sand Wash (RM 215); however, we have not recaptured many smallmouth bass making an abundance estimate impossible to calculate. The project began in 2004 and is still ongoing. We will have analyzed our removal effect in an annual report each year, but plan to do this more in depth with the nonnative removal interim report due in spring 2007. See annual reports for project 109 and 123 for more information on these removal projects.

Objective 3: Estimate response of small-bodied native fish to removal of northern pike and smallmouth bass in the middle Green River.

2005

Sampling to evaluate a response of small-bodied native fish to nonnative predator removal was conducted by seining suitable low-flow and backwater habitats. Three low-velocity habitats were sampled every five miles dependent upon the number of these habitats available within the reach. Currently, the first two backwaters encountered in each 5-mile subreach are sampled under project # 138, YOY Colorado pikeminnow monitoring. Sampled backwaters were blocked at the mouth using a large small-mesh seine to allow for closed sampling and a better evaluation of fish species composition and densities. This was also to facilitate depletion sampling for abundance estimation.

Backwater/low velocity habitats were sampled using a 1.2 m x 4 m seine with 3 mm mesh. At least two non-overlapping seine hauls were conducted in each habitat sampled. Preferably the two seine hauls were parallel to one another and perpendicular to the axis of the backwater. However, if water depth was too great, a haul was completed along one shoreline. The first two seine hauls were taken at 1/3 and 2/3 the distance from the mouth of the backwater. Additional seine hauls were sometimes completed in other portions of the habitat including the mouth or shallow tail of a backwater. Length of each seine haul, maximum depth, and average depth were recorded for each sample. All endangered and native fishes were identified, measured (mm) for total length, and returned alive to the habitat (see Table 1). Ray counts were completed for all chubs (*Gila* spp.) captured. All nonnative fishes were enumerated and returned to the backwater habitat (see Table 2).

Table 1. Total numbers, lengths and mean catch-per-unit-effort (CPUE; fish/100m^2), by species for native fish and white sucker caught in backwater habitats of the middle Green River in October 2005. Total area sampled was 10,863m^2. This information was collected solely from the third backwater habitat/5-mile stretch. See annual report for project 138 for information from remaining two backwaters/5-mile stretch.

Species	Number Caught	Mean Length (mm)	Length Range (mm)	CPUE (Fish/100m^2)
Bluehead sucker	6	56	50 – 60	0.1
Chub (*Gila* spp.)	29	52	31 – 104	0.3
YOY Colorado pikeminnow	55	48	30 – 70	0.5
Juvenile Colorado Pikeminnow	2	128	123 – 132	0.02
Flannelmouth sucker	25	58	38 – 123	0.2
Speckled dace	3	51	49 – 52	0.03
White Sucker	48	64	44 - 87	0.4

Table 2. Total numbers, lengths and mean catch-per-unit-effort (CPUE; fish/100m^2), by species for small-bodied nonnative fish caught in backwater habitats of the middle Green River in October 2005. Total area sampled was 10,863m^2. This information was collected solely from the third backwater habitat/5-mile stretch. See annual report for project 138 for information from remaining two backwaters/5-mile stretch.

Species	Number Caught	CPUE (Fish/100m^2)
Black crappie	105	1.0
Black bullhead	1	0.01
Channel catfish	8	0.1
Carp	46	0.4
Fathead minnow	1849	17.0
Green sunfish	38	0.3
Red shiner	38,705	356.3
Sand shiner	12,113	11.5
Smallmouth bass	7	0.1

2006

Sampling to evaluate a response of small-bodied native fish to nonnative predator removal was conducted by seining suitable low-flow and backwater habitats. Three low-velocity habitats were sampled every five miles dependent upon the number of these habitats available within the reach. Information from all three backwaters is summarized in this report. Currently, the first two backwaters encountered in each 5-mile subreach are sampled under project # 138, YOY Colorado pikeminnow monitoring, and information from these two backwaters specifically is contained in that project report.

Backwater/low velocity habitats were sampled using a 1.2 m x 4 m seine with 3 mm mesh. At least two non-overlapping seine hauls were conducted in each habitat sampled. Many backwaters were large and required three or even four seine hauls to sample the targeted 25% of backwater area. Preferably the two seine hauls were parallel to one another and

perpendicular to the axis of the backwater. However, if water depth was too great, a haul was completed along one shoreline. The first two seine hauls were taken at 1/3 and 2/3 the distance from the mouth of the backwater. Additional seine hauls were sometimes completed in other portions of the habitat including the mouth, but not the shallow tail of a backwater. Length of each seine haul, maximum depth, and average depth were recorded for each sample. All endangered and native fishes were identified, measured (mm) for total length, and returned alive to the habitat (see Table 3). All nonnative fishes were enumerated and discarded (see Table 4).

Logistical differences between effort in 2005 vs. 2006 include dates: September 29th through October 18th in 2005 vs. September 13th through October 3rd in 2006; temperatures: 10ºC to 14ºC (main channel), 10ºC to 16ºC (backwaters) in 2005 vs. 7ºC to 22ºC (main channel), 9ºC to 23ºC (backwaters) in 2006; and flow: 1800 – 2200cfs in 2005 vs. 1100 – 1800cfs in 2006. In addition, crews in 2005 used a block net to keep fish from exiting the backwater during sampling. This block was not used in 2006.

Of potential interest in 2006 is the more than double catch rate of red shiner, from 356.3 fish/100m^2 to 861.34 fish/100m^2; the observation of small gizzard shad in backwaters; and the decrease in the number of native species and the number of individuals within each native species. Not all gizzard shad were measured; however, of those that were (n=8), their mean length was 39.75mm. Lengths of these fish ranged from 36mm to 41mm. Given that fish of such small total lengths were found in multiple backwaters from river mile 281 to 215 (nine total backwaters), a logical conclusion is that this species has begun to reproduce in the middle Green River. Detection of recruitment will be reported if observed in future electrofishing efforts.

Table 3. Total numbers, lengths and mean catch-per-unit-effort (CPUE; fish/100m^2), by species for native fish caught in backwater habitats of the middle Green River in September and October, 2006. Total area sampled was 9861m^2.

Species	Number Caught	Mean Length (mm)	Length Range (mm)	CPUE (Fish/100m^2)
Colorado pikeminnow	5	45.8	36 – 50	0.05
Flannelmouth sucker	18	61.6	45 – 75	0.18
Bluehead sucker	2	47	47	0.02

Table 4. Total numbers, lengths and mean catch-per-unit-effort (CPUE; fish/100m^2), by species for small-bodied nonnative fish caught in backwater habitats of the middle Green River in September and October, 2006. Total area sampled was 9861m^2.

Species	Number Caught	CPUE (Fish/100m^2)	Change from 2005
Black crappie	26	0.26	-0.74
Black bullhead	9	0.09	+0.08
Gizzard shad	51	0.52	N/A
Carp	180	1.83	+1.43
Fathead minnow	4356	44.17	+27.17
Green sunfish	24	0.24	-0.06
Red shiner	84,937	861.34	+505.04
Sand shiner	7083	71.83	+60.33
White sucker	11	0.11	-0.29
Bluegill	303	3.07	N/A
Brown trout	21	0.21	N/A
Smallmouth bass	5	0.05	-0.05
Unidentified shiner	12,030	122.00	N/A

VII. Recommendations: Continue monitoring efforts as outlined in approved scope of work. Due to the perceived (though not yet tested) increase in nonnative small-bodied fishes from 2005 to 2006, a backwater depletion scope of work should be re-visited for FY2007 or FY 2008. An analysis of seasonal smallmouth bass stomach contents should be initiated to determine fish species most often consumed by this predator to verify (or refute) that nonnative removal projects are the cause of this increase in nonnative cyprinids.

VIII. Project Status: on track and ongoing

IX. FY 2006 Budget Status

A. Funds Provided: $32,300
B. Funds Expended: $32,300
C. Difference: $0
D. Percent of the FY 2006 work completed, and projected costs to complete: 100%
Recovery Program funds spent for publication charges: $0

X. Status of Data Submission: Data will be submitted to database manager January 2007.

XI. Signed: Trina Hedrick November 8, 2006
Principal Investigator Date